

I. PINE RIVER WATERSHED

A. THE WATERSHED

The Pine River watershed is located in the northwestern portion of Michigan's lower peninsula. It has a drainage area of 265 square miles, and ultimately discharges to Tippy Dam Impoundment in Manistee County. The watershed includes parts of four counties: Wexford, Osceola, Lake and Manistee. The mainstream is approximately 49 miles long and is formed by the confluence of the North Branch and East branch of the Pine River near Tustin in Osceola County at an elevation of 1,102 feet (336m). The North Branch headwaters are just south of Cadillac in Wexford County, while the east branch headwaters are north of Tustin. From this point the river meanders southerly until it reaches the Osceola-Lake county line. Here, the river turns and meanders northwesterly until it reaches Tippy Dam Impoundment and the Manistee River. Along the way, the river is fed by many tributaries, most of which are high quality trout streams. The river discharges to Tippy Dam Impoundment at an elevation of 685 feet (209m), resulting in a total drop in elevation from the headwaters to the mouth of 417 feet, an average of 8.5 feet per mile.

B. CLIMATE

The watershed offers a climate typical of Michigan's "north country" that is strongly affected by Lake Michigan. The warm days and cool nights offer a pleasant summer haven for residents and tourists. Winter's abundant snowfall provides excellent conditions for skiing, snowmobiling, and other winter sports.

Mean January and July temperatures are 17.4 and 58.7 degrees F, respectively. The average low temperature for January is 10.4 degrees F, while the average high temperature for July is 80.2 degrees F. The average length of growing season is 121 days.

The summer season yields 34 percent of the annual precipitation, with another 30 percent occurring during the fall. The low occurs in February with an average monthly yield of 1.44 inches. Annual precipitation averages 32.04 inches.

C. TRANSPORTATION AND AREA GOVERNMENT

One major US highway, US 131, currently crosses the headwaters area of the watershed. This is a limited-access highway from southwest Michigan to just north of Cadillac, crossing the East Branch of the Pine River and several tributaries.

Several state highways traverse the river or tributaries in various parts of the watershed, including M-37 in Wexford County and M-55 and M-115 in Wexford and Manistee counties. In addition, many paved and unpaved year-round county roads, as well as seasonal roads and two-tracks, are present in all counties.

Commercial airline service is available at Traverse City, north of the watershed. Although there are rail lines in the watershed, no passenger rail service is available.

The watershed includes portions of four counties and 14 townships, although 2 of those townships have no appreciable stream mileage. Incorporated municipalities in the watershed include Tustin and Leroy.

D. GEOLOGICAL HISTORY

The predominating historical influence on the Pine River is, of course, its geologic background. The unique conditions left by the Pleistocene glaciers that advanced and retreated from this portion of Michigan's Lower Peninsula provided the ecological framework for the plant and animal communities in the watershed. Many of the characteristics that make this river system worthy of consideration for Natural River designation are directly attributable to the porous nature of the glacial outwash deposited between the Lake Border and Port Huron Moraine.

Meltwaters pouring off the Port Huron ice sheet carved out two large discharge channels running east and west. The present-day Manistee River "under-fits" the westerly channel, resulting in the appearance of a large river valley and delta formed by a relatively small river. The Au Sable River occupies the easterly channel, discharging to Lake Huron at Oscoda.

E. HISTORICAL HUMAN INFLUENCES

Earliest archaeological evidence of human inhabitants dates to the Paleo-Native American period, over 10,000 years ago. These were nomadic people who followed herds of game animals. By 500 BC, there was a change to a more sedentary lifestyle as people established camps for a season or more and agricultural practices were developed.

Ninety-seven archeological sites are listed in the watershed (Table 1). Actual scholarly study of the Pine River archaeology has been limited.

Prior to European exploration in the first half of the 1600's, Native American tribes including the Ottawas, Potawatomis and Chippewas used the Manistee River watershed and its resources. The Native American "Manistee River" name has several documented meanings, including "river at whose mouth are islands," "river with white bushes along the banks," "crooked river," and "spirit of the woods."

Many area tribes intentionally burned certain areas in the watershed to manage habitat and vegetation types. This activity likely stopped near the time of the first European exploration when French explorers came to the region, primarily motivated by the fur trade (Jean Nicolet, in 1634, is thought to be the first white man to visit northern Michigan). The tribes built no large permanent settlements, but traveled to stations throughout the Pine River watershed to hunt, fish and gather the region's rich plant resources. They continued these activities throughout the French and British regimes in Michigan, spanning the years roughly between 1634 and 1812.

In 1760, the English took control of northern Michigan from the French. The newly formed United States of America laid claim to the former French and British colonial territories in the Great Lakes region in 1776. The Ordinance of 1787, which settled the terms of peace between Great Britain and the United States, allowed the British to retain their Michigan posts until 1796. However, the British remained at their posts long past that date. On April 3, 1802, an Act of Congress created the State of Ohio, also making Michigan part of the Territory of Indiana. A January 1805 Act of Congress provided for the organization of the Territory of Michigan. Ottawas, Chippewas and Potawatomis joined with Tecumseh and the British in an unsuccessful effort to repel the U.S. during the war of 1812. On October 13, 1813 General Lewis Cass was appointed Civil Governor of Michigan Territory. He created the first county, Michilimackinac, bounded on the east by the Cheboygan River, the south by the Manistee River, the west by the Manistique River, and by Canada on the north.

In 1821 and again in 1836, Ottawa bands living along the Manistee ceded title to their lands to the United States. By 1830, the Government Land Office survey of Michigan had begun, creating the township, range, and section system we now have. Prior to this time, the Manistee River watershed was still relatively undeveloped by non-natives. In 1837 came statehood for Michigan and in 1840, the creation of counties as we know them today.

Non-natives were late in developing the watershed, in part due to a large sand bar at the Manistee River's mouth, and also due to the high gradient waters located not far upstream (the present site of Tippy Dam). In 1854-55, a canal was dug through the sand bar allowing the rapid settlement of the City of Manistee and subsequent timber harvest and log drives that had a profound impact on the river system. The interior portion of the watershed was not logged until after 1870, as the river was choked with logjams.

The onset of the logging era began what may have been the greatest human influence on the river system. Large-scale removal of logs changed fisheries and wildlife habitat and the very character of the area. The loggers not only removed numerous logjams and large woody debris from the stream channel, they rolled logs down the banks (the "rollways") and drove them to market in the spring. Without trees to stabilize the exceptionally sandy soils in the area, huge amounts of sediment entered the river. Although erosion and sediment transport are natural functions in a stream environment, such a massive artificial influx of additional sediment often overwhelms natural stream processes. Once in the stream, the increased sediment load begins to affect the aquatic environment. The deposition of sand and sediment along the stream bottom causes the stream to overflow its banks. As this occurs, sediment begins to flow laterally and cover the edges of the stream. As the sediment builds up, the stream channel begins to braid, forming several channels in a wider, flatter area. Stream temperatures rise, and fish lose valuable habitat for feeding, resting, and spawning. These effects can be observed on the Pine River.

From the early 1840's to 1940, the lifestyles of the Native American people, and thus their influence on the river, underwent several changes due in part to the increased presence of non-natives. After the 1855 Treaty of Detroit, Ottawas formed new permanent agricultural settlements south of the watershed. By the late 1870s, many Ottawas had sold or lost title to their lands, and migrated to the outskirts of newly formed towns or more isolated areas, still primarily relying on the natural resources of the area to earn a living. From the 1890s to 1940, Indian Village in Brown Township on the Manistee River served as a center of the traditional Little River Ottawa band gathering, fishing and trapping economy.

In 1900, the Manistee River was proclaimed Michigan's last great "un-harnessed" river, capable of producing 40,000 horsepower of electricity. Stronach Dam on the Pine River was the first hydroelectric dam on the system, being completed in 1912. Stronach Dam originally supplied power to the City of Manistee. The Michigan Railway Company acquired the project around 1915, with the intention of supplying power to a proposed electric railway. Consumers Power Company acquired the project in 1917 after the electric railway plans were abandoned and operated the plant until July 8, 1953. Tippy Dam was completed and began producing power in 1918. Tippy Dam was then called Junction Dam, being at the confluence of the mainstream and South Branch Manistee, as the Pine River was formerly called.

The construction of these and other smaller dams had a great influence on the river system. Dams have a variety of effects on river ecosystems. They influence flow patterns and alter channel cross-sections. They fragment the river system, blocking drift and migration by fish and other aquatic

organisms. They change river temperatures (making some areas unsuitable for native fish to survive), increase evaporation and reduce stream flow, disrupt sediment and woody debris transport and modify water quality. They can also cause significant direct fish mortalities. Impoundments also result in a loss of riverine habitat and the subsequent changes in fish and aquatic invertebrate populations. The Pine River shows all of these effects.

The onset of the “modern age” saw a restructuring of the economic and social order in many communities, native and non-native, and with it new influences of the watershed. With lesser reliance on the natural resources of the area for subsistence, increased agricultural, urban and residential uses began to have a greater impact.

From 1933 to 1942, enrollees in the many Civilian Conservation Corps camps in the Pine River watershed had a significant impact on the river system. Reforestation efforts by the corps helped hasten recovery from the devastating logging activities of the recent past. Many erosion control and habitat structures were constructed during this time. The corps also planted millions of fish in area streams, fought forest fires and built many area campgrounds.

Oil and gas exploration also began in the watershed in the 1930's. The majority of early development occurred in Osceola and Lake counties during the 1940's through early 1960's. The Niagaran Reef oil development began in the late 1960's, with the majority of the activity occurring between 1969 and 1986. Deep gas exploration occurred sporadically in the watershed beginning in the 1980's. Shallower Antrim gas development began in 1987. The potential for additional Antrim development continues to exist throughout the watershed.

Agricultural land uses can also have dramatic affects on aquatic environments, particularly where there is no vegetative buffer between agricultural areas and a stream. Although this use is limited in the Pine River system, the affects of agriculture can be seen in some areas. Tillage of soil increases erosion and sediment inputs to streams. These sediments bury gravel and cobbles critical to reproduction and survival of many fish species. Riparian vegetation is often removed, resulting in loss of habitat, warming of water temperatures and reduced filtering of contaminants. Wetlands, important as spawning and living areas for many species and important to the water quality of the system, were frequently drained to increase land available for tillage. Water withdrawal for irrigation can reduce summer base flows and negatively impact the river.

Land development for residential and other “urban” uses also has dramatic impacts on the aquatic environment. These impacts are increasing with the recent trends of increased development of northern Michigan waterfront properties. Sediment from construction activities, removal of streamside vegetation, filling of wetland and floodplain areas, increase of impervious land area adjacent to streams resulting in warmer temperatures, increased pollutant loads and less stable flows, and discharge of pollutants from wastewater treatment plants and individual wastewater systems such as septic tank/drain fields are all examples of the effects of urbanization on the Pine River system.

Part of the Pine's value is evident in the way it has influenced people's lifestyles since early times. Native Americans depended on the river for transportation, food, and water. Early settlers depended on it in much the same way, as it later became the sole means of transporting logs to the sawmills and thereby was very important to early residents' way of life. Today the river and its adjoining lands fill different purposes, but they are still important to everyday life. The river and lands are a recreational and commercial resource for many people. Current local culture has partly

been determined by the need to meet the demands of users of the river and the surrounding resources. These demands continue to have an influence on the river corridor.

F. BIOLOGICAL COMMUNITIES

1. ORIGINAL FISH COMMUNITIES

An accurate, comprehensive description of the fish community at the time of European settlement is not available. Michigan grayling were abundant in the Pine River prior to European settlement, especially in the upper reaches. Suckers, shiners, northern pike, and whitefish are the only other fish mentioned by early observers as associated with grayling in Michigan streams. Other species present, but not easily observed, would have been blacknose & longnose dace, sculpin, and chestnut and brook lamprey. Potamodromous species (fish that spawn in fresh water rivers but spend their adult lives in fresh water lakes) including lake sturgeon, lake trout, lake and round whitefish, burbot, walleye, and troutperch inhabited the river seasonally.

The Boardman River was thought to be the most southerly stream that native brook trout inhabited. However, brook trout may have been native to the Manistee River watershed. A newspaper article in the Manistee Times dated Sept. 11, 1869 by George C. Depres cited that a Mr. Ruggles and other gentlemen took a large "mess" of "speckled brook trout" from Pine Creek, a tributary to the Manistee River downstream of Tippy Dam. The change of the Pine River from grayling to a trout river was attributed to competition, over-harvest, and habitat destruction during the logging era.

2. PRESENT FISH COMMUNITIES

European settlement caused dramatic changes in the Pine River and its watershed, many of which changed the river's fish communities. Logging, dams, agricultural and urban land use, point-source discharges, lake-level controls and introduction of exotic species, both intentional and unintentional, have all had an impact on the river system and therefore on its fish communities.

The watershed is now thought to contain 80 fish species (Table 2). Species distributions vary from one small inland lake to watershed-wide. One species has been extirpated and some are rare or threatened, while most native species are still present. Two species, the lake sturgeon and pugnose shiner, are considered "threatened" by the State of Michigan. Thirteen non-native fish species have been introduced into the watershed (Table 3). These include unintentional and intentional introductions and migrations.

A brief description of the existing fish populations by river segment follows:

Pine River

The Pine River has fair self-sustaining populations of brook, brown, and rainbow trout. The Pine is noted for the largest non-migratory rainbow populations in Michigan. The stretch from Tippy Dam backwaters to the mouth of the East Branch of the Pine is classified as a "Blue Ribbon" trout stream. Population data indicates that the Pine River has one-third of the standing crop of trout relative to other similar rivers. No fish stocking is done in the Pine River.

Tippy Dam Pond

Tippy Dam Pond provides a fishery for smallmouth bass, pike, and walleye. Walleye and channel catfish have been planted in the past. The state record walleye (17 lbs. 3 oz.) was caught in the Pine River arm of the backwaters.

Tributaries

Almost all tributaries are designated trout streams.

3. UNUSUAL FISH COMMUNITIES/HABITATS

The Pine River is home to an unusual fish community. A population of resident, non-migratory rainbow trout is present in the river in numbers sufficient to provide a sustainable fishery.

4. MAMMALS

Beaver, mink, muskrat, raccoon, otter, cottontail rabbits, snowshoe hare and fox and red squirrels are some of the mammal species associated with the Pine River watershed. All of these species are present in moderate to very abundant populations. White-tailed deer are abundant, and are seasonally dependent upon the mainstream and tributary corridors and headwater areas in the watershed. Deer use these sites for yarding purposes when severe winters force them to abandon the uplands. Black bear, bobcat, fox and coyotes can also be found in areas of the watershed, but are seldom observed.

Three species of mammals that frequent the watershed are listed in the Michigan Natural Features Inventory (Table 4). The pine marten is considered “threatened” by the State of Michigan, while the woodland vole is a species of “special concern.” Pine martens, which were extirpated, have been reintroduced along the Pine River uplands.

Recently, a colony of Indiana Bats, listed as “endangered” in the Michigan Natural Features Inventory, was found to be hibernating inside Tippy Dam. This is the northernmost known hibernaculum for Indiana Bats. Studies continue regarding roosting habits of the bats in this area.

5. BIRDS

A large variety of waterfowl nest in the watershed. The watershed is within the Mississippi Flyway used by migrating ducks and geese.

A review of the Michigan Natural Features Inventory identified eight species of birds listed as endangered, threatened or of special concern that may frequent the area. They include the bald eagle (threatened), common loon (threatened), king rail (endangered), Kirtland's warbler (endangered), loggerhead shrike (endangered), northern harrier (special concern), osprey (threatened), and red shouldered hawk (threatened). The bald eagle, loon, king rail, osprey, and red shouldered hawk are intrinsically associated with the watershed, either for habitat or feeding areas. A nesting pair of bald eagles near Tippy Dam reared 11 eaglets between 1989 and 1994. One other scarce bird species present in the area is the pileated woodpecker, a species that thrives in mature forests.

6. AMPHIBIANS AND REPTILES

Thirty-eight species of amphibians and reptiles have been documented in the Pine River system or its associated wetlands (Table 5). Three species are currently listed as of "special concern" in the Michigan Natural Features Inventory. They are the Massasauga rattlesnake, spotted turtle, and wood turtle. The wood turtle is of special interest in that its nesting sites are sandy stream banks and it lives in river corridors. Breeding areas are of prime importance since nesting habitat may be reduced by river rehabilitation projects that stabilize and re-vegetate eroding stream banks. Studies on the Au Sable River (lower peninsula) and Indian River (upper peninsula) on the nesting requirements of the wood turtle indicate the wood turtle is fairly selective in choosing a nesting site, preferring gentle sloping south and west facing banks. Studies in Minnesota and Wisconsin have identified commercial and casual collection as the major cause of wood turtle decline. This is partly due to the turtles' apparent lack of fear of humans, allowing canoeists and others to easily approach and capture individuals. On-going studies also indicate that nest predation by racoons may have a major effect on population levels.

7. AQUATIC INVERTEBRATES

No comprehensive invertebrate studies have been done in the Pine River watershed. Invertebrates often are sensitive indicators of habitat problems that are affecting fish and other aquatic life. Dr. Justin Leonard (1937) studied macroinvertebrates as trout food in the Pine River. He found an abundant macroinvertebrate food source, including high densities of crayfish.

No species of mussels are currently listed for this area in the Michigan Natural Features Inventory (Table 4). However, no definitive studies have been conducted in the watershed and a complete inventory of the mussel species present would be beneficial.

8. PEST SPECIES

Pest species are defined here as those species that have been introduced, either accidentally or intentionally, or are exceptionally damaging to economic values, and that pose a significant threat to native species or their habitat. Most species do not pose any threat unless they are present in high densities.

The only fish pest species that is abundant in the Manistee River, its impoundments, tributaries, or natural lakes is the chestnut lamprey. While chestnut lamprey do cause mortalities to trout, the mortality is not significant.

A pest species of mollusk, the zebra mussel, was found in Tippy Dam Pond in 1997. They spread primarily by veligers (larval stages) being transported from one water body to another in water contained in outboard motors or boats.

Spiny water flea has invaded Lake Michigan, but no colonization has been documented in the Pine River. Rusty crayfish are in the Manistee River system, being very abundant below Tippy Dam. The "Rusty" is an exotic species, probably introduced by bait dealers and anglers. It is an extremely aggressive crayfish, even known to attack swimmers' toes, and has often replaced native species where introduced.

There are two known pest plant species in the Pine River system, purple loosestrife and Eurasian milfoil.

Several terrestrial pest species are present, among them gypsy moth, forest tent caterpillar, spruce budworm, and jackpine budworm. None are present in high enough densities to be a problem except the gypsy moth, which can cause severe tree mortality in forested areas. The gypsy moth itself does not kill the tree, but lowers its resistance to other diseases and parasites, especially in oaks on poorer sites.

Other natural features, animals and plants that occur in the Pine River area are listed in Table 4.

G. HYDROLOGY AND CHANNEL MORPHOLOGY

1. ANNUAL STREAM FLOWS

Draining an area of 265 square miles, the Pine River has an average discharge of 376 cubic feet per second (cfs) at the United States Geological Survey (USGS) gauge station located near Wellston. Average discharge rates, from the headwaters downstream, are as follows: East Branch Pine River near Tustin (Osceola County) - 36 cfs; Pine River near Leroy (Osceola County) - 79 cfs; Pine River near Luther (Lake County) - 211 cfs; and Pine River at High School Bridge (Wexford County) - 328 cfs.

2. SEASONAL FLOW STABILITY

Flow stability can be critical to support balanced and diverse fish communities. It is also a determining factor in ecological and evolutionary processes in streams and has been positively correlated to fish abundance, growth, survival, and reproduction.

The Pine River, especially some areas of the East Branch of the Pine River, has less stable flows than some of its close neighbors like the Manistee and Au Sable rivers, particularly during high flow periods. However, flows are fairly stable during low (drought) flows, indicating significant groundwater input.

3. DAILY FLOW STABILITY

Human-induced factors such as dam operations and some lake-level control structure operations can cause significant daily flow fluctuations. These daily fluctuations can destabilize banks, create abnormally large moving sediment bedloads, disrupt habitat, strand organisms, and interfere with recreational uses of the river. Aquatic production and diversity are profoundly reduced by such daily fluctuations.

Hydroelectric dams that operate in a peaking mode can cause significant habitat degradation. These projects generate high flood flows during peak electrical demand and drought flows during non-peak periods. Historically, Tippy Dam was operated as a peaking operation. The Federal Energy Regulatory Commission (FERC) license for Tippy Dam was renewed in 1994 as a “run-of-the-river” project (see “Special Jurisdictions”). The operators of this facility on the mainstream had been voluntarily operating at run-of-the-river since 1989 with very positive biological benefits observed. Some of these benefits observed are abundant chinook and steelhead reproduction,

reduced bank erosion, natural re-vegetation of stream banks, and spawning runs of lake sturgeon. Elimination of peaking operations may also have altered the character of some previously periodically inundated wetlands.

4. CHANNEL GRADIENT

River gradient is one of the main controlling influences on the river channel. Steeper gradients allow faster water flows with accompanying changes in depth, width, channel meandering, and sediment transport.

The average gradient of the Pine River mainstream is 10-15 feet per mile, one of the highest gradient streams in the Lower Peninsula. Naturally, some portions of the river are steeper than average while others are more gradual. These different gradient areas create different types of channel, and hence different kinds of habitat for fish and other aquatic life. Typical channel patterns in relation to gradient are listed below. In these descriptions, hydraulic diversity refers to the variety of water velocities and depths found in the river. The best river habitat offers such variety to support various life functions of various species.

<u>Gradient Class</u>	<u>Channel Characteristics</u>
0.0 - 2.9 feet/mile	Mostly run habitat with low hydraulic diversity
3.0 - 4.9 feet/mile	Some riffles with modest hydraulic diversity
5.0 - 9.9 feet/mile	Riffle-pool sequences with good hydraulic diversity
10.0 - 69.9 feet/mile	Well established, regular riffle-pool sequences with excellent hydraulic diversity
70.0 - 149.9 feet/mile	Chute and pool habitats with fair hydraulic diversity
> 150 feet/mile	Falls and rapids with poor hydraulic diversity.

5. STREAM CHARACTERISTICS

The 49-mile length of Pine River mainstream traverses a variety of water conditions. It has many sharp bends, short choppy riffles, and passable log and woody debris jams. From Walker Bridge to Peterson Bridge (M-37) there are occasional large rocks and clay ledges in the faster water.

The Pine River has a high mean daily flow of 1,830 cfs and a low of 175 cfs. Flood peak discharge equals 2,240 cfs. The Pine River is unusual among area rivers in that it may rise 1 to 4 ft above its average level during heavy rains or spring melt. The river gradient averages 10-15 ft./mi., highest of any stream in northwest lower Michigan. This creates nearly ideal riffle-pool conditions.

Stronach Dam on the lower Pine River was operated from approximately 1912 to 1953 to provide electric power for local use. The impoundment has filled with silt, leaving approximately 2 to 3 ft deep water, and is now useless for power generation. Inflow equals outflow at this time. The area under Stronach Dam impoundment has a gradient of 25 ft./mi., some of the best potential spawning

area of the entire stream. The staged removal of this dam is underway and is scheduled for completion in 2003.

Tippy Dam Pond

The Pine River area inundated by Tippy Dam was a high gradient riffle area (over 15 ft./mi.) This area was high quality gravel/cobble substrate spawning habitat.

H. VEGETATION, SOILS AND LAND USE PATTERNS

The historical vegetative cover of the watershed was predominantly pine forest and hardwood forest, with wetlands intermixed. The current landscape is predominantly coniferous, deciduous, or wetland forest (54 percent), agricultural land (39.03 percent) and a few urban areas (3.29 percent). Common tree species in areas with loamy soils include northern white cedar, balsam fir, red maple, and basswood. In the higher, sandy areas, red pine, jack pine and oak dominate.

Current land use patterns in the watershed are approximately as follows:

Urban and suburban	3.29%
Agricultural	39.03%
Range land	1.71%
Coniferous forest	12.18%
Deciduous forest	29.28%
Wetlands (forested & non-forested)	12.83%
Lakes and streams	1.68%

While thirty-nine percent of the area is listed as agricultural land, little of this is tilled cropland. The majority is pasture, fruit orchards, or Christmas tree plantations. Major tilled agricultural areas include the North Branch of the Pine River in Cherry Grove Township, Wexford County and the East Branch of the Pine River in Burdell and Sherman Townships, Osceola County.

The soils along the Pine River corridor are mostly the Tawas-Croswell-Lupton series, with significant areas of Rubicon-Montcalm-Graycalm series and Nestor-Kawkalin-Manistee series. Many of these series are clays, loams and mucks that are moderately to poorly drained soils.

Soils of the watershed include the following (percentages are approximate).

Clayey	7.9%
Loamy/organic/sand/gravel/sandy	41.4%
Sandy	19.4%
Wet/clayey/loamy/sandy/organic	29.6%
Inland lakes and streams	1.7%

I. LAND OWNERSHIP

The State of Michigan MDNR and the U.S. Forest Service have extensive land ownership in the Pine River corridor. Table 6 reflects the ownership along the Pine River within the Natural River corridor. A total of 35 percent (4,772 acres) of the river corridor lands are in public ownership. Of that public ownership, the State of Michigan manages 14 percent (653 acres) and the U.S. Forest Service manages 86 percent (4,119 acres).

J. RECREATIONAL USES

Fishing and canoeing are two of the most popular recreational uses on the Pine River system. These two activities also generate user conflicts in some areas at certain times of the year.

1. CANOEING

Nearly the entire Pine River mainstream is canoeable. Headwater segments and tributaries are not generally suitable for canoeing due to brush, logjams, and beaver dams.

The Pine River is most heavily canoed from Lincoln Bridge to Low Bridge and is in fact one of the most heavily canoed waterways in the nation, with the number of launches limited on US Forest Service lands through a permit system. Under this system 44,000 launches are reserved for the six Pine River-area canoe liveries and 11,000 launches are reserved for private canoes annually. Tubing is also increasing in popularity, and is not currently regulated through the permit system. Numerous canoe liveries are located in the Pine River areas.

Canoe trip lengths and conditions for various segments of the system are as follows (much of this information is taken from "Canoeing Michigan Rivers" by Jerry Dennis and Craig Date, 1986 Friede Publications):

PINE RIVER

Edgetts Bridge to Elm Flats, 18 miles, approximately 5-7 hours

Although it is possible to canoe the river upstream of Edgetts Bridge with some difficulty, it is not recommended due to the small size of the river and the numerous deadfalls blocking passage. Downstream of Edgetts, the river is 20-40 feet wide, one to four feet deep with moderate to quick current. There may be occasional fallen trees blocking the river in the upper sections of this stretch, particularly in the spring. Intermediate access is good, with access sites and two State Forest campgrounds along the way. From Lincoln Bridge downstream, USFS watercraft permits are required to use Federal lands for access, and camping is not permitted except at designated campgrounds. There are occasional houses and cottages in this section, but the area is lightly developed overall.

Elm Flats to Peterson Bridge, 12.5 miles, approximately 3-5 hours

From Elm Flats access site to Dobson Road access site, current is moderate to quick, with many tight turns. Downstream of Dobson, and particularly downstream of High School Bridge, the current picks up speed and there are numerous riffle areas and light rapids. The rapids are Class II at worst in high water, but can be a challenge to inexperienced canoeists.

Peterson Bridge to Low Bridge, 2 ½ to 3 ½ hours

Fast water continues almost to Stronach Dam. At this writing, the dam is being removed over a seven-year period, which should extend the fast current areas by up to two miles. Presently, portage the dam on the right. At a minimum, basic canoeing skills are recommended for this section and parts of the section upstream. There is very little development in this section, and high, forested banks line the river. Downstream of Stronach Dam, the influence of Tippy Dam can be seen. The river slows and widens as the paddler approaches Low Bridge. Most paddlers

end their trip here, but the trip can be extended downstream into Tippy Pond and then the lower Manistee River.

2. FISHING

Trout fishing is extremely popular throughout the river system, including the smallest of tributaries (also see “**Present Fish Communities**”). Currently, salmon and steelhead are blocked from migration upstream by Tippy Dam, so fishing is almost exclusively for resident trout.

Upper portions of the Pine River mainstream and all of the lesser tributaries are wadeable. Most contain brook and brown trout, with an unusual population of resident rainbow trout present in the Pine River. Additionally, there are small wadeable portions in downstream reaches of the lower river, particularly in higher gradient riffle areas.

The impoundment behind Tippy Dam contains good populations of walleyes, smallmouth bass, channel catfish and others. These fish are currently blocked from migrating into most of the Pine River by the remnants of Stronach dam and by high gradient, cold waters unsuitable for those species

3. OTHER RECREATIONAL ACTIVITIES

Hunting for a variety of game is popular in the watershed. Game mammals such as white-tailed deer, squirrels, snowshoe hares and cottontail rabbits are abundant in many areas. Game birds present include ruffed grouse, woodcock, a large wild turkey population and many varieties of waterfowl.

Other popular recreational activities include camping, picnicking, trapping, ORV trail riding, cross country skiing, hiking, horseback riding, bird watching and simply observing the river and its associated flora and fauna. Segments of the North Country National Scenic Trail are located in the watershed, some coinciding with the existing Shore to Shore Trail. Numerous snowmobile trails exist in the watershed. An ORV trail crosses the Pine River at the Silver Creek Campground.

There are numerous campgrounds and public access points throughout the river system. These are listed in Table 7.

K. DAMS AND BARRIERS

There are currently 12 known dams in the Pine River watershed, regulated under authority of Michigan's Dam Safety Part 315 of 1994 PA 451 (Table 8). Most of these have a head of ten feet or less. None have a head greater than 20 feet. The storage capacity of most of these dams is very small, in the 0-10 acre-feet range. With the removal of Stronach Dam, only two dams have a storage capacity greater than 100 acre-feet.

Stronach Dam is the sole retired hydroelectric facility on the Pine River. Consumers Energy agreed to set aside \$750,000 for the removal of Stronach Dam as part of the recent Tippy/Hodenpyl Federal Energy Regulatory Commission (FERC) license. This will restore two miles of high gradient high quality cold water fish habitat. A long-term fish and habitat study of the areas above and below the dam is being conducted. The results of the study will be used to determine whether a fish barrier will be constructed to block migration of coolwater species from Tippy Dam Pond into the Pine River.

L. MINERAL EXTRACTION

The watershed has experienced a great deal of oil and gas activity since the 1930's. Earlier exploration and extraction activities focused on recovering oil from formations in the eastern and southern areas of the watershed. The Niagaran Reef that is present throughout the northern portion of the watershed was first developed in the late 1960's. Since 1987, there has been increased activity related to Antrim gas development, tapping relatively shallow gas reserves throughout the watershed.

M. WATER QUALITY

Overall surface water quality in the Pine River basin is excellent. Water quality parameters under normal conditions meet the criteria for total body contact recreation, and aquatic life. This is due in large part to the deep permeable soils of the watershed which allow precipitation to rapidly be absorbed. This leads to groundwater flows being the dominant contributor to river flow. Limited development has also helped preserve water quality.

No National Pollution Discharge Elimination System (NPDES) permits for surface water discharge of effluent exist for the basin.

The Michigan Environmental Response Act, Act 307 of 1982, as amended, provides for identification, risk assessment and evaluation of sites of environmental contamination. One hundred twenty-three such sites have been identified in the Pine River Basin (Table 10). None are listed on the Environmental Protection Agency's (EPA) National Priority List (Superfund).

With good water quality in the watershed, fish populations in the river system have not been subject to any specific fish consumption advisories.

Almost all of the waters of the Pine River are classed as designated trout streams, with only the Rose Lake Outlet and the backwaters of Tippy Dam being classified as warmwater areas.

N. SPECIAL JURISDICTIONS

Numerous Federal and State laws and county, township and municipal ordinances affect the river and riparian zones. Some Federal laws and many State statutes affecting the river and its adjoining lands are administrated by the Michigan Department of Environmental Quality (MDEQ), Land and Water Management Division (LWMD) (Table 12).

1. NAVIGABILITY

Navigable Waters as Public Waters

The definition of legal navigability of Michigan streams (i.e. "public waters") is part of an ongoing controversy. Public and private rights related to water have historically been determined by the courts. A navigable water has been defined as any water which in its natural state is capable of and has been used for the purposes of commerce, travel and trade by the customary and ordinary modes of navigation. The floating of logs during the lumbering era was held to be an act of commerce. Consequently, any lake or stream used for this purpose would be considered navigable. Thus, the

“log floatation test” has largely become the method of determining the “navigability” of a stream in Michigan, and therefore whether that stream is a public water.

On a navigable stream, the public has the right to float the stream, wade on the submerged soil and to fish in the stream. This right does not extend to trespass upon the private lands of abutting landowners, except that a wading angler may enter upon the upland to avoid a hazard or other impediment obstructing passage within the stream. The public should also feel secure in making a portage around any dam or other obstruction. The banks of a public stream are subject to the public easement only so far as they are necessary to exercise the right of passage and navigation. There have been periodic legislative efforts in Michigan to refine the definition of a navigable water.

Whether a stream is determined to be navigable has no bearing on whether it may be designated a Natural River. Also, designation of a stream as a Natural River has no bearing on its status as a navigable water.

None of the Pine River system has been declared non-navigable by the courts. Interestingly, the Pine River was the subject of a landmark Michigan Supreme Court decision (*Collins v. Gerhardt* in 1926) that held that the public had the common right of fishing in any part of a navigable stream subject only to the restraints and regulations imposed by the State.

2. FEDERAL ENERGY REGULATORY COMMISSION

The Federal Energy Regulatory Commission (FERC) currently regulates the operations of Tippy Dam. In 1993, an offer of settlement regarding the re-licensing of this dam and ten other hydroelectric dams on the Manistee, Au Sable and Muskegon Rivers was drafted for presentation to FERC. Some of the “project lands” affected by Tippy Dam are on the lower portion of the Pine River.

This settlement was entered into voluntarily by and between Consumers Power Company (now Consumers Energy) and the United States Department of Agriculture Forest Service (USFS), the United States Department of Interior Fish and Wildlife Service (USFWS), the Michigan Department of Natural Resources (MDNR), the United States Department of Interior National Park Service (NPS), and the Michigan State Historic Preservation Officer (SHPO). The settlement concerns the future handling of issues such as project operation, fish passage, project boundaries, land management, water quality, downstream fish protection, historical and archaeological resource management, soil erosion control, and threatened, endangered and sensitive species management. It also establishes retirement funds for the hydroelectric projects.

In July 1994 FERC adopted most of the settlement agreement. The major issues include:

Land Management Plans: Management plans have been written by Consumers Energy with input from resource agencies for all project lands. These plans shall include recreation, Federal and State listed threatened, endangered, candidate and sensitive species; wildlife and their habitat; and forestry sections.

Downstream Fish Protection: Consumers Energy agreed to study, plan, design, construct, operate and maintain fish entrainment protection devices or measures. Consumers Energy also agreed to conduct evaluation studies on the effectiveness of measures once installed.

Fish Passage: Consumers Energy will provide for design, construction, operation and maintenance of fish passage structures (upstream and associated downstream) at each hydroelectric project,

provided a comprehensive river management plan which demonstrates the appropriateness of fish passage has been developed by the MDNR, the USFS does not object to fish passage at the facility and FERC approves such structures.

Annual Contributions to the Habitat Improvement Account: Consumers Energy agreed to provide contributions to the State of Michigan Habitat Improvement Account to be used for fisheries habitat enhancement, aquatic studies, fisheries recreation, water quality improvement and soil erosion control activities on the Manistee River.

Water Quality Monitoring: Consumers Energy agreed to study, plan, design, construct, operate and maintain water quality enhancements for the river, including dissolved oxygen enhancement measures and temperature enhancement measures. These enhancement measures include monitoring stream flow and water quality parameters at a number of stations along the river corridor.

Historical and Archaeological Resources: Consumers Energy will provide funding for historical and archaeological resources evaluation, mitigation, and enhancement activities. All prudent measures will be taken to assure protection of historical and cultural resources.

Soil Erosion Control: Consumers Energy will provide funding for soil erosion control. These funds will be used to correct severely eroded sites that were influenced by the past peaking operation of the projects.

Project Operations: Tippy project will be operated as a “run-of-river” project. “Run-of-the-river” for Tippy Dam means that the flow through the dam will be approximately equal to the flow at Hodenpyl Dam upstream plus the inflow of the Pine River.

3. COUNTY DRAINS

County Drain Commissioners have authority to establish designated drain systems under the Michigan Drain Code (PA 40, 1956). This allows for construction or maintenance of drains, creeks, rivers, and watercourses and their branches for flood control and water management. A designated drain may be cleaned out, straightened, widened, deepened, extended, consolidated, relocated, tiled, and connected to improve flow of water. Designated drains constructed prior to January 1, 1973 are exempt from the provisions of the Inland Lakes and Streams Part and the Wetlands Protection Part of 1994 PA 451.

4. FEDERAL WILD AND SCENIC RIVERS

A portion of the Pine River mainstream is designated as a Wild and Scenic Rivers under provisions of the Federal Michigan Scenic Rivers Act of 1991 (PL 102-249). This includes 25 miles of the Pine River from Lincoln Bridge to Stronach Dam backwaters classified as a “Scenic” river.

The U.S. Forest Service, which administers lands along these sections, has developed management plans for Federal lands in these three areas. Federal designation of these rivers does not result in condemnation or mandatory zoning of private lands along the rivers.

O. CITIZEN INVOLVEMENT

Many citizens groups take an active role in protecting and managing the Pine River watershed. Such groups often act in partnership with MDNR, USFS and other government agencies to work toward the improvement of the river system. Such groups include the Michigan Council of Trout Unlimited, Pine River Area Chapter of TU, Michigan Steelheaders, Michigan River Guides Association, Pine River Association, Mackinaw Trail Fly Fishers, George Mason Chapter of TU, Michigan Chapter of Fly Fishing Federation, Pine River Canoe Livery Association, Michigan Land Use Institute and the Michigan Hydropower Coalition. The non-profit Conservation Resource Alliance have been instrumental in forming partnerships with many of these groups in the form of restoration committees dedicated to stabilizing eroding streambanks and improving inadequate road/stream crossings. Seven of these groups have formed the Pine River Watershed Coalition,

Many citizens took an active role in helping MDNR develop this Natural River management plan as part of the Pine River Citizens Advisory Group. Group members represented a wide range of interests such as property owners, local government, local and State-wide citizen and sporting groups, local business and interested citizens from the local area and outside the area. The knowledge and commitment of group members over a three-year planning process was invaluable in the development of recommendations for stream segments to be designated and use and development standards for both public and private lands along those segments.